

NAME: _____

PS ID: _____

MATH 1432 - QUIZ 4

Show your work to get proper credit.

(1)[3 Pts] Calculate the following indefinite integral

$$\begin{aligned}
 \int \cos^4(x) \sin^3(x) dx &= \int \cos^4(x) \cdot \sin^2(x) \cdot \sin(x) dx \\
 &= \int \underbrace{\cos^4(x)}_{u^4} \cdot [1 - \cos^2(x)] \cdot \sin(x) dx \\
 &\quad (1 - u^2) \quad -du \Rightarrow -u^4 + u^6 \\
 &= \boxed{-\frac{(\cos^5(x))}{5} + \frac{(\cos^7(x))}{7} + C.}
 \end{aligned}$$

(2)[3 Pts] Calculate the following indefinite integral

$$\begin{aligned}
 \int \frac{e^{2x}}{e^{4x} + 7} dx &= \int \frac{e^{2x}}{(e^{2x})^2 + (\sqrt{7})^2} dx \stackrel{\uparrow}{=} \frac{1}{2} \int \frac{du}{u^2 + (\sqrt{7})^2} = \frac{1}{2} \cdot \frac{1}{\sqrt{7}} \tan^{-1}\left(\frac{u}{\sqrt{7}}\right) + C \\
 &\quad \text{let } u = e^{2x} \\
 &\quad du = 2e^{2x} dx \\
 &\quad \Rightarrow \frac{du}{2} = e^{2x} dx \\
 &= \boxed{\frac{1}{2\sqrt{7}} \tan^{-1}\left(\frac{e^{2x}}{\sqrt{7}}\right) + C}
 \end{aligned}$$

(3)[4 Pts] Calculate the following indefinite integral

$$\int \frac{1}{x^2 - 2x + 7} dx = \int \frac{dx}{(x-1)^2 + (\sqrt{6})^2} = \frac{1}{\sqrt{6}} \cdot \tan^{-1}\left(\frac{x-1}{\sqrt{6}}\right) + C$$

(Hint: Use completion of squares.)

$$\begin{aligned}
 &x^2 - 2x + 1 - 1 + 7 \\
 &= (x-1)^2 + 6 \\
 &= (x-1)^2 + (\sqrt{6})^2
 \end{aligned}$$